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Benicia Refinery • Valero Refining Company - California

3400 East Second Street • Benicia, California 94510-1097 • Telephone (707) 745-7011 • Facsimile (707) 745-7339

Via Email Notification

October 19, 2020

Reportable Flaring Event Causal Analysis
August 21st 2020
Plant No. B2626

Mr. Jack Broadbent
Bay Area Air Quality Management District
Bay Area Metro Center
375 Beale Street, Suite 600
San Francisco, CA 94105

Dear Mr. Broadbent:

A reportable flaring event occurred on August 21st, 2020 at the Valero Refining Company – California, Benicia Refinery (Valero Refinery) (Id. No. B2626). The following Causal Analysis for this Reportable Flaring Event is provided to the Bay Area Air Quality Management District (District) pursuant to and in accordance with Section 12-12-406 and the District's Compliance Advisory dated June 25, 2007.

1. *Date on which the report was drafted (12-12-406).*

October 19, 2020

2. *The refinery name and site number (12-12-406).*

Valero Refinery, Id. No. B2626

3. *The assigned refinery contact name and phone number (12-12-406).*

Kimberly Ronan at (707) 745-7990

4. *Identification of the flare(s) at which the reportable event occurred by reviewing water seal monitoring data to determine which seals were breached during the event (12-12-406).*

South (S-18) and North (S-19) Flare

5. *The flaring event duration for each affected flare (12-12-406.1):*

- a) *The date(s) of the event;*
- b) *The start and end time of the event; and*
- c) *The net duration of event (in hours and minutes).*

Item	South Flare (S-18)	North Flare (S-19)	Flare Event Total
Start Date	08/21/2020	08/21/2020	08/21/2020
Start Time (hh:mm)	13:55	13:55	13:55
End Date	08/21/2020	08/21/2020	08/21/2020
End Time (hh:mm)	21:05	23:50	23:50
Duration (hh:mm)	07:10*	09:55*	09:55*

*Flaring was intermittent during this time period

6. A brief description of the flaring event (12-12-406.1) (e.g., "flaring due to turnaround maintenance").

Flaring was due to an unplanned shutdown of the Hydrocracker Unit and subsequent startup of the unit.

7. A process flow diagram showing the equipment and process units that were the primary cause of the event (12-12-406.1).

The relevant piping and instrumentation diagrams (P&IDs) are attached and highlighted.

Please note that the attached P&ID contains information that the Valero Refinery considers to be trade secret and confidential business information (CBI) as defined by the California Public Records Act, Government Code § 6254.7 et seq., and the Freedom of Information Act, 40 CFR Part 2 (40 CFR § 2.105(a)(4)), 5 USC 552(b)(4), and 18 USC 1905. Because of the sensitive and competitive nature of this information, the Valero Refinery requests that the District afford the information CBI status and treatment indefinitely.

8. The total volume of vent gas flared (MMSCF) throughout the event (12-12-406.5).

Item	South Flare (S-18)	North Flare (S-19)	Flare Event Total
08/21/2020			
Volume (MMSCF)	0.547	0.548	1.095
Flare Event Total			
Volume (MMSCF)	0.547	0.548	1.095

9. The emissions associated with the flaring event per calendar day (12-12-406.5):
- a) # methane (CH₄) emitted;
 - b) # non-methane hydrocarbon emitted; and
 - c) # SO₂ emitted.

Also provide the assumptions used to calculate emissions associated with the flaring event if they are different from those used for reporting under Regulation 12, Rule 11.

Item	South Flare (S-18)	North Flare (S-19)	Daily Total
08/21/2020			
CH4 (lbs)	310	254	564
NMHC's (lbs)	111	130	241
SO2 (lbs)	264	299	562
Flare Event Total			
CH4 (lbs)	310	254	564
NMHC's (lbs)	111	130	241
SO2 (lbs)	264	299	562

The assumptions used to calculate emissions associated with the flaring event are consistent with those used for reporting under Regulation 12, Rule 11.

10. *A statement as to whether or not the gas was scrubbed to eliminate or reduce any entrained compounds and a list of the compounds for which the scrubbing was performed (12-12-406.1).*

The vent gases flared during this event were not scrubbed.

During non-emergency operations, the Valero Refinery recovers gases routed to the flare header for treatment. The Refinery does not have the capability of scrubbing process unit vent gases that are sent to the flare header during an emergency depressure of the HCU.

11. *The primary cause of the flaring event including a detailed description of the cause and all contributing factors. Also identify the upstream process units that contributed vent gas flow to the flare header and provide other flow instrumentation data, where available (12-12-406.1).*

The primary cause of the August 21st flare activity was the unplanned shutdown of the HCU as a result of a user interface error with the Control Board used to monitor and control the HCU.

During the course of making routine manual adjustments on the unit, the Control Board Operator (CBO) was adjusting the reactor bed temperatures to optimize the temperature profile through the reactor bed in order to optimize the catalyst usage. These optimization actions are often small increments made over several adjustments. During this time, the CBO was also making routine adjustments to a fin-fan exchanger wash water to optimize water rates. The CBO has four screens to monitor and control the unit, and at this time he had a lower screen that showed the reactor adjustments being made and an upper screen that showed the exchanger adjustments being made.

After making another adjustment on the reactor temperature, the CBO then intended to make another adjustment on the exchanger wash water, but the CBO did not realize that the screen interface still had the reactor temperature selected. Instead of adjusting the temperature of the exchanger as intended, the CBO inadvertently caused the reactor temperature to rapidly decrease its target temperature from 700°F to 640°F. This sudden drop in temperature subsequently triggered an

automatic increase in the quench, which then triggered a temperature drop through the entire reactor. The CBO quickly recognized the temperature drop and attempted to make adjustments to renormalize the bed temperatures per normal guidelines. The rapid decrease in temperature followed by a rapid increase in temperatures did not provide enough time for the quench valves to respond, and this resulted in some hot temperature indications in the reactor. The reactor has many temperature indications within each bed to monitor and prevent a runaway reaction. If two or more of the eighteen temperature readings in a reactor bed are above 825°F, it triggers an automatic high rate depressuring program (HRDP) to prevent further temperature runaway, which could result in a process safety incident. This HRDP system was established in early 2020 as part of a recommended best practice for operational safeguards. This event was the first time the HRDP had been activated since its installation.

When the HRDP was automatically activated, it depressured the HCU to the flare header in under ten minutes. The rapid volume of gas in flare header exceeded the rate of recovery of the flare recovery system, and thus resulted in flaring.

Once the unit was depressured and returned to a safe posture, operations personnel began re-normalizing the unit following prepared startup procedures. At this time, the bulk material in the unit had been cleared during the HRDP, but there was still residual oil in the unit and the catalyst in the reactors was still at elevated temperatures. While working through the startup procedure, one of the reactor beds had a rapid temperature increase, and the HRDP system was tripped again due to the increased temperature on two of the eighteen temperature readings in the reactor. This caused additional flaring due to the rapid increase in volume to the flare header system. Once the unit depressured, it was put into a safe posture and was successfully restarted following prepared procedures.

After the event, an investigation determined that an upgrade to the CBO screen stations made in 2018 created an issue with the selection of parameters when using the toggle screen. The CBO station has four screens. Prior to 2018, three of the four screens were used to display process graphics and one screen was used to display a summary page. In 2018, the system was upgraded so that the summary page could also be toggled to display a fourth process graphic instead. The CBO uses the process graphics to monitor the unit and select parameters to make manual adjustments. When a parameter is selected, there is a small graphic, called a face plate, which pops up on the side of the graphic and displays some information on that parameter. The investigation found that when a parameter on the toggle screen is selected, it triggers the face plate to pop up on the screen below instead. During the event, the CBO was adjusting the exchanger water flows on the toggle screen while also adjusting the reactor temperatures on the lower screen, so the two parameter face plates were being displayed in the same location and the CBO did not immediately recognize that their attempt to select the exchanger parameter was not received by the screen and the screen had still selected the reactor parameter.

12. *Describe all immediate corrective actions to stabilize the flaring event, and to reduce or eliminate emissions (flare gas recovered or stored to minimize flaring during the event). If a decision was made not to store or recover flare gas, explain why (12-12-406.1).*

Immediate corrective actions that were taken to stabilize the flaring event and to reduce or eliminate emissions include:

- A. Control House monitoring
- B. The shutdown and depressuring operations and subsequent startup operations followed prepared procedures. These procedures are intended to minimize flaring and ensure the safety of personnel and equipment. The Valero Refinery has developed specialized procedures to comply with the unique requirements imposed by the BAAQMD's stringent flare rule Reg. 12-12.
- C. Operations verified that no unnecessary sources were venting to the flare system prior to beginning the unit startup.
- D. Normalized HCU operations as soon as possible.

The Valero Refinery does not have the ability to store flare gas. Per Section 4.2 of the FMP, the ability to store flare gas is not a cost effective prevention measure.

13. *Was the flaring the result of an emergency (See definition in Reg. 12-12-201)? If so, was the flaring necessary to prevent an accident, hazard or release to the atmosphere (12-12-406.4)?*

This section is not applicable, as this flaring incident was not the result of an emergency. However, the trip was automatically triggered to avoid an emergency (temperature runaway in the reactors) and required immediate shutdown and subsequent restart of the HCU.

14. *If not the result of an emergency and necessary to prevent an accident, hazard or release to the atmosphere, was the flaring consistent with an approved FMP? If yes, provide a citation to the facility's FMP and any explanation necessary to understand the basis for this determination (12-12-406.3).*

Pursuant to Regulation 12-12-301, flaring is prohibited unless it is consistent with an approved FMP. The current approved FMP is Revision 15.0 dated September 30, 2019. This series of events is consistent with Section 2.2 of the Valero Refinery FMP, Reasons for Flaring:

2.2.3 – Equipment Failure and Malfunction

15. *If the flaring was due to a regulatory mandate to vent to a flare, why couldn't the gas be recovered, treated, and used as fuel gas (12-12-406.4)?*

The flaring was not due to a regulatory mandate to vent to a flare. The flaring was consistent with the Valero Refinery's approved FMP.

16. *Identify and describe in detail each prevention measure (PM) considered to minimize flaring from the type of reportable flaring event that occurred (12-12-406.2):*

- a) *State whether the PM is feasible (and will be implemented), or not feasible.*
- b) *Explain why the PM is not feasible, if applicable.*

During a post-incident review of the flaring event, the following additional prevention measures were identified in order to prevent a similar flaring event from reoccurring in the future:

- A. Determine if the toggle screen can display the face plate function and, if so, activate that function to avoid screen selection uncertainty.
- B. Implement a limit on reactor bed outlet temperature set point changes to avoid unintentional temperature changes.
- C. Implement controls that prevent the reactor outlet controls from being put into manual control.
- D. Review emergency procedures to identify possible improvements to the procedures when responding to a temperature runaway scenario.
- E. Review emergency procedures to identify possible improvements to the procedures to posture the unit when restarting the unit after an emergency depressure event.

Please contact Ms. Kimberly Ronan at (707) 745-7990 if you have any questions on this reportable flare event.

Sincerely,



Kimberly A. Ronan
Manager – Environmental Engineering

ecc:

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Chris Crowley ccrowley@baaqmd.gov;

Christopher Thompson cthompson@baaqmd.gov

Enclosures: (1 P&ID)

36-000-03E-73503 – Confidential Business Information (CBI)

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